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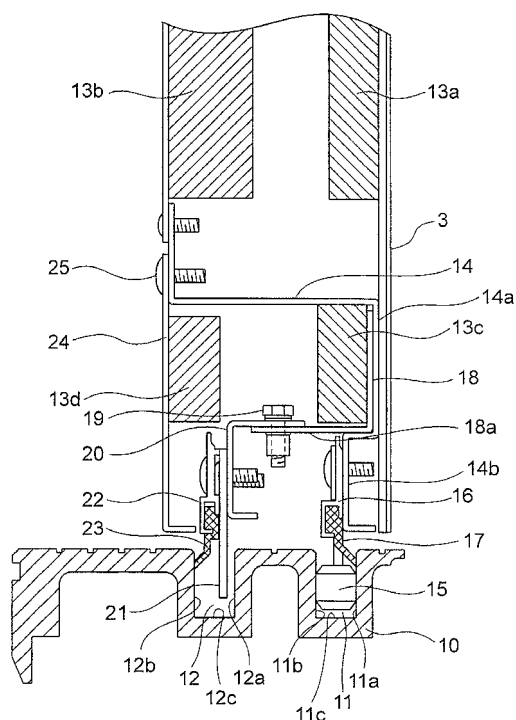
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(54) **CAR DOOR DEVICE FOR ELEVATOR**

(57) In an elevator car door apparatus, a second doorsill groove is disposed on a car doorsill in addition to a first doorsill groove into which a door foot is inserted. A first sealing member that is made of an elastic body is disposed on a lower portion of a car door panel so as to contact a side surface of the first doorsill groove, and is slid along the side surface of the first doorsill groove during opening and closing operations of the car door panel. A second sealing member that is made of an elastic body is disposed on a lower portion of the car door panel so as to contact a side surface of the second doorsill groove, and is slid along the side surface of the second doorsill groove during the opening and closing operations of the car door panel.

FIG. 2



Description

TECHNICAL FIELD

[0001] The present invention relates to an elevator car door apparatus for elevators in which car sound insulation is sought such as very high-speed elevators that are installed in high-rise buildings, for example.

BACKGROUND ART

[0002] In elevators that are installed in high-rise buildings, car elevating speeds reach several hundred meters a minute, and wind noise that is generated around the moving car is extremely loud. Because of this, means for preventing the generation of wind noise as much as possible, and for suppressing entry of wind noise into the cage, etc., have been considered.

[0003] In order to suppress the generation of wind noise, one method is to smooth air flow by making a shape of the cage a shape that has fewer irregularities, or by installing streamlined covers above and below the cage, for example. In conventional elevators, in order to suppress the entry of wind noise into the cage, adhesive members are disposed above and below a car doorway and above and below a door panel such that gaps around a car door are sealed by the adhesive members adhering to each other when the door panel is closed (see Patent Literature 1, for example).

[0004] In other conventional elevators, a blocking apparatus that displaces vertically is disposed on a car door such that a gap between the car door and a car doorsill is sealed by the blocking apparatus when the car door is fully closed (see Patent Literature 2, for example).

CITATION LIST

PATENT LITERATURE

[0005]

[Patent Literature 1]

Japanese Patent Laid-Open No. HEI 10-120349 (Gazette)

[Patent Literature 2]

Japanese Patent Laid-Open No. 2003-306286 (Gazette)

SUMMARY OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0006] In elevator apparatuses such as that disclosed in Patent Literature 1, it is necessary for the adhesive members to be placed in contact above and below the car doorway simultaneously when the door is closed, thus demanding extremely high-level workability and installation. If the door must be closed using an extremely

large door closing force, the load on the door motor is increased because it is difficult to place the adhesive members in close contact with each other above and below the car doorway.

[0007] In addition, a door rail that suspends the car door and a driving apparatus that opens and closes the car door are mounted to an upper portion of a car frame, and because the cage is supported on a lower portion of the car frame by means of a rubber vibration isolator, the cage may sink relative to the car frame by approximately 2 to 3 mm when a large number of passengers board the cage. The gap between the car door and the car doorsill is thereby widened, and there is a risk that the sealing member that is disposed on the lower portion of the car door will not contact the car doorsill.

[0008] A blocking apparatus such as that shown in Patent Literature 2 is one solution, but the configuration is complicated, and increased weight of the car door is of concern. Furthermore, if the passengers happen to be trapped inside the cage by a power outage, etc., greater resistance occurs when opening the car door manually because a pressing force is generated toward the car doorsill by the blocking apparatus.

[0009] In addition, in elevators that are equipped with air pressure controlling apparatuses for relieving ear blockage due to sudden fluctuations in air pressure, differences in air pressure of approximately 1,000 Pa occur between internal and external portions of the cage, since pressure adjustment is performed while the car is in motion. Thus, if the car doorway is two square meters, for example, then the car door is subjected to a force of 2,000 N. Since the direction in which the force is borne is different depending on whether the pressure is increasing or decreasing, minute fluctuations in both forward and rearward directions occur at the car door.

[0010] Consequently, in elevators in which high sound insulating performance is required, such as very high-speed elevators, there is demand to ensure that a blocked state is maintained at a gap between the lower portion of the car door and the car doorsill against both vertical displacement of the cage relative to the car frame and displacement of the car door in a depth direction due to air pressure controlling apparatuses, and that greater resistance does not occur when opening the car door manually.

[0011] The present invention aims to solve the above problems and an object of the present invention is to provide an elevator car door apparatus that maintains high sound insulating performance against vertical displacement of a cage relative to a car frame and displacement of a car door panel in a depth direction using a simple construction, that can suppress increases in load on a door motor, and that can ensure that greater resistance does not occur when opening the car door manually.

MEANS FOR SOLVING THE PROBLEM

[0012] In order to achieve the above object, according

to one aspect of the present invention, there is provided an elevator car door apparatus including: a car door panel that opens and closes a car doorway; a car doorsill that is disposed on a lower portion of the car doorway, and that includes first and second doorsill grooves that are disposed parallel to an opening and closing direction of the car door panel; a door foot that is disposed on a lower portion of the car door panel, and that is inserted into the first doorsill groove; a first sealing member that is made of an elastic body that is disposed on a lower portion of the car door panel so as to contact a side surface of the first doorsill groove, and that is slid along the side surface of the first doorsill groove during opening and closing operations of the car door panel; and a second sealing member that is made of an elastic body that is disposed on a lower portion of the car door panel so as to contact a side surface of the second doorsill groove, and that is slid along the side surface of the second doorsill groove during the opening and closing operations of the car door panel.

EFFECTS OF THE INVENTION

[0013] In an elevator car door apparatus according to the present invention, because the second doorsill groove is disposed on the car doorsill in addition to the first doorsill groove into which the door foot is inserted, and the first sealing member that contacts the side surface of the first doorsill groove and the second sealing member that contacts the side surface of the second doorsill groove are disposed on the lower portion of the car door panel, vertical displacement of the cage relative to the car frame can be absorbed by vertical sliding movement of the first and second sealing members and displacement of the car door panel in a depth direction absorbed by elastic deformation of the first and second sealing members using a simple configuration, thereby enabling high sound insulating performance to be maintained. Because the first and second sealing members are slid along the side surfaces of the first and second doorsill grooves during the opening and closing operations of the car door panel, greater door closing force is not necessary, enabling increases in load on the door motor to be suppressed, and also preventing greater resistance from being generated when opening the car doors manually.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Figure 1 is a front elevation that shows an elevator car door apparatus according to Embodiment 1 of the present invention; and

Figure 2 is a cross section that is taken along line II - II in Figure 1.

DESCRIPTION OF EMBODIMENTS

[0015] A preferred embodiment of the present invention will now be explained with reference to the drawings.

Embodiment 1

[0016] Figure 1 is a front elevation that shows an elevator car door apparatus according to Embodiment 1 of the present invention. In the figure, a car doorway 1a is disposed on a front surface of a car 1 (indicated by double-dotted chain lines). The car doorway 1a is opened and closed by a pair of car doors 2. Each of the car doors 2 has: a car door panel 3; and a door hanger 4 that is connected to an upper portion of the car door panel 3. A pair of hanger rollers 5 is disposed on each of the door hangers 4.

[0017] A door rail 6 is fixed to an upper portion of the car doorway 1a of the car 1. The door panels 3 are suspended from the door rail 6 by means of the door hangers 4. During the opening and closing of the car doors 2, the hanger rollers 5 are rolled along the door rail 6.

[0018] A door motor 7 that opens and closes the car doors 2 is mounted onto an upper portion of the car 1. A driving force from the door motor 7 is transmitted to the car door panels 3 by means of a speed reducing mechanism 8 and a linking mechanism 9. The left and right car doors 2 are operated by the linking mechanism 9 so as to open and close interdependently simultaneously in opposite directions. Landing doors (not shown) are also operated so as to open and close together with the car doors 2 by engaging with the car doors 2.

[0019] A car doorsill 10 that guides movement of lower end portions of the car door panels 3 during the opening and closing operations of the car doors 2 is fixed to a lower portion (a floor portion) of the car doorway 1a.

[0020] Figure 2 is a cross section that is taken along line II - II in Figure 1, and shows a longitudinal cross section of a lower end portion of a car door panel 3. In Figure 2, the right side of the car door panel 3 is a cage side, and the left side is a landing side. First and second doorsill grooves 11 and 12 that are disposed parallel to the opening and closing direction of the car door panel 3 are disposed on the car doorsill 10 so as to be spaced apart from each other. The second doorsill groove 12 is disposed on the landing side of the first doorsill groove 11.

[0021] The first doorsill groove 11 has a first cage-side side surface 11a, a first landing-side side surface 11b, and a first bottom surface 11c. The second doorsill groove 12 has a second cage-side side surface 12a, a second landing-side side surface 12b, and a second bottom surface 12c. A depth of the second doorsill groove 12 is similar or identical to a depth of the first doorsill groove 11. The first and second doorsill grooves 11 and 12 are disposed directly below the car door panel 3 within a thickness region of the car door panel 3.

[0022] A plurality of sound absorbing members 13a through 13d are fixed inside the car door panel 3.

[0023] A lower portion reinforcing member 14 is fixed to a lower portion of the car door panel 3. The lower portion reinforcing member 14 is disposed over an entire width (a lateral direction in Figure 1) of the car door panel 3. The lower portion reinforcing member 14 has: a joining portion 14a that is glued or welded onto a rear surface of the car door panel 3; and a foot mount portion 14b that faces the rear surface of the lower end portion of the car door panel 3. The joining portion 14a and the foot mount portion 14b are formed by bending a flat plate.

[0024] A plurality of door feet 15 are held on the foot mount portion 14b by screws so as to be spaced apart from each other in a width direction of the car door panel 3. The door feet 15 are inserted into the first doorsill groove 11. The door feet 15 are moved through the first doorsill groove 11 during the opening and closing operations of the car door panel 3. Wobbling, etc., during the opening and closing operations of the car door panel 3 is thereby suppressed.

[0025] A plurality of first sealing members 17 are mounted to the foot mount portion 14b by means of a first metal brace 16. The first metal brace 16 is fastened onto the foot mount portion 14b by a screw. Upper end portions of the first sealing members 17 are held between the first metal brace 16 and the foot mount portion 14b. The first sealing members 17 are disposed on an entire width of the car door panel 3 except for portions on which the door feet 15 are mounted.

[0026] The first sealing members 17 are constituted by elastic bodies of rubber, etc., and lower end portions thereof are slightly elastically deformed by contacting the first cage-side side surface 11a. The first sealing members 17 are thereby slid along the first cage-side side surface 11a during the opening and closing operations of the car door panel 3.

[0027] A fixing member 18 that has an L-shaped cross section is fixed by gluing or welding to a rear surface of the joining portion 14a of the lower portion reinforcing member 14. The fixing member 18 has a horizontal portion 18a. A metal mounting fitting 20 is mounted onto the horizontal portion 18a by a screw 19. The screw 19 is fastened vertically from an upper surface side of the metal mounting fitting 20.

[0028] A sound insulating plate 21 and a second metal brace 22 are fastened to the metal mounting fitting 20 by a screw. A lower end portion of the sound insulating plate 21 is inserted into the second doorsill groove 12. The sound insulating plate 21 is made of steel, and is disposed continuously over the entire width of the car door panel 3.

[0029] A second sealing member 23 is held between the second metal brace 22 and the sound insulating plate 21. The second sealing member 23 is disposed continuously over the entire width of the car door panel 3.

[0030] The second sealing member 23 is constituted by an elastic body of rubber, etc., and a lower end portion thereof is slightly elastically deformed by contacting the second cage-side side surface 12b. The second sealing

members 23 are thereby slid along the second cage-side side surface 12b during the opening and closing operations of the car door panel 3.

[0031] A back plate (a cover) 24 that faces the metal mounting fitting 20 and the second metal brace 22 is mounted to the lower portion reinforcing member 14. The back plate 24 is disposed continuously over the entire width of the car door panel 3, and is mounted in a vicinity of an upper end portion of the lower portion reinforcing member 14 by a plurality of screws 25.

[0032] In a car door apparatus of this kind, because the second doorsill groove 12 is disposed on the car doorsill 10 in addition to the first doorsill groove 11 into which the door feet 15 are inserted, and the first sealing members 17 that contact the first cage-side side surface 11a and the second sealing member 23 that contacts the second landing-side side surface 12b are disposed on the lower portion of the car door panel 3, vertical displacement of the cage relative to the car frame can be absorbed by vertical sliding movement of the first and second sealing members 17 and 23 and displacement of the car door panel 3 in the depth direction (a lateral direction in Figure 2) absorbed by elastic deformation of the first and second sealing members 17 and 23 using a simple configuration, thereby enabling high sound insulating performance to be maintained.

[0033] Because the first and second sealing members 17 and 23 are slid along the side surfaces 11a and 12b of the first and second doorsill grooves 11 and 12 during the opening and closing operations of the car door panel, greater door closing force is not necessary, enabling increases in load on the door motor 7 to be suppressed, and also preventing greater resistance from being generated when opening the car doors 2 manually.

[0034] In addition, because the first sealing members 17 contact the first cage-side side surface 11a, and the second sealing member 23 contacts the second landing-side side surface 12b, at least one of the first and second sealing members 17 and 23 can be maintained in a state of contact with the car doorsill 10 relative to displacement of the car doors 2 in the depth direction when the cage is pressurized or depressurized by air pressure controlling apparatuses (not shown), enabling high sound insulating performance to be maintained.

[0035] Because the sound insulating plate 21 that is inserted into the second doorsill groove 12 is used, sound insulation can be further improved.

Because the first sealing members 17 are disposed on the entire width of the car door panel 3 except for the portions on which the door feet 15 are mounted, and the second sealing member 23 and the sound insulating plate 21 are disposed on the entire width of the car door panel 3, sound insulation can be further improved while avoiding interference between the door feet 15 and the first sealing members 17.

[0036] In addition, if the first and second sealing members 17 and 23 are abraded by repeated opening and closing operations of the car doors 2, the screws fixing

the second metal brace 22 can be exposed by unscrewing the screws 25 and removing the back plate 24, enabling the second sealing member 23 to be easily replaced. From this state, the screw fixing the first metal brace 16 can be exposed by unscrewing the screw 19 and removing the metal mounting fitting 20, enabling the first sealing member 17 also to be easily replaced.

[0037] Moreover, if configured so as not to interfere with the door feet 15, a first sealing member 17 may also be disposed continuously along the entire width of the car door panel 3.

The first metal brace 16, the first sealing members 17, the second metal brace 22, the second sealing member 23, and the sound insulating plate 21, etc., may also be divided in the width direction of the car door panel 3 if required.

[0038] In addition, in the above example, the first sealing members 17 contact the first cage-side side surface 11a, and the second sealing member 23 contacts the second landing-side side surface 12b, but the first sealing members 17 may also be made to contact to the first landing-side side surface 11 b, and the second sealing member 23 made to contact the second cage-side side surface 11 a.

Furthermore, two first sealing members 17 may also be used, or the lower end portion of the first sealing members 17 may also be branched bidirectionally, such that the first sealing members 17 contact both the first cage-side side surface 11a and the first landing-side side surface 11 b. Similarly, the second sealing member 23 may also be made to contact both the second cage-side side surface 12a and the second landing-side side surface 12b.

[0039] In the above example, the door feet 15 are inserted into the doorsill groove 11 on the cage side, and the sound insulating plate 21 is inserted into the doorsill groove 12 on the landing side, but that may also be reversed. In other words, the landing side may also be set as the first doorsill groove 11 and the cage side set as the second doorsill groove 12.

In addition, a two-door centrally-opening car door apparatus is shown in the above example, but the type of car door apparatus is not limited thereto.

Furthermore, elevators to which the car door apparatus according to the present invention is applied are not limited to very high-speed elevators, and sound insulation can also be increased if applied to ordinary elevators.

Claims

1. An elevator car door apparatus comprising:

a car door panel that opens and closes a car doorway;

a car doorsill that is disposed on a lower portion of the car doorway, and that comprises first and second doorsill grooves that are disposed parallel to an opening and closing direction of the

car door panel;

a door foot that is disposed on a lower portion of the car door panel, and that is inserted into the first doorsill groove;

a first sealing member that is made of an elastic body that is disposed on a lower portion of the car door panel so as to contact a side surface of the first doorsill groove, and that is slid along the side surface of the first doorsill groove during opening and closing operations of the car door panel; and

a second sealing member that is made of an elastic body that is disposed on a lower portion of the car door panel so as to contact a side surface of the second doorsill groove, and that is slid along the side surface of the second doorsill groove during the opening and closing operations of the car door panel.

2. An elevator car door apparatus according to Claim 1, wherein:

the side surface that the first sealing member contacts is a first side surface on one of a cage side or a landing side of the first doorsill groove; and

the side surface that the second sealing member contacts is a second side surface on the other of a cage side or a landing side of the second doorsill groove.

3. An elevator car door apparatus according to Claim 1, further comprising:

a sound insulating plate that is disposed on a lower portion of the car door panel, and that is inserted into the second doorsill groove.

4. An elevator car door apparatus according to Claim 3, wherein:

the first sealing member is disposed on an entire width of the car door panel except for a portion onto which the door foot is mounted; and the second sealing member and the sound insulating plate are disposed on an entire width of the car door panel.

FIG. 1

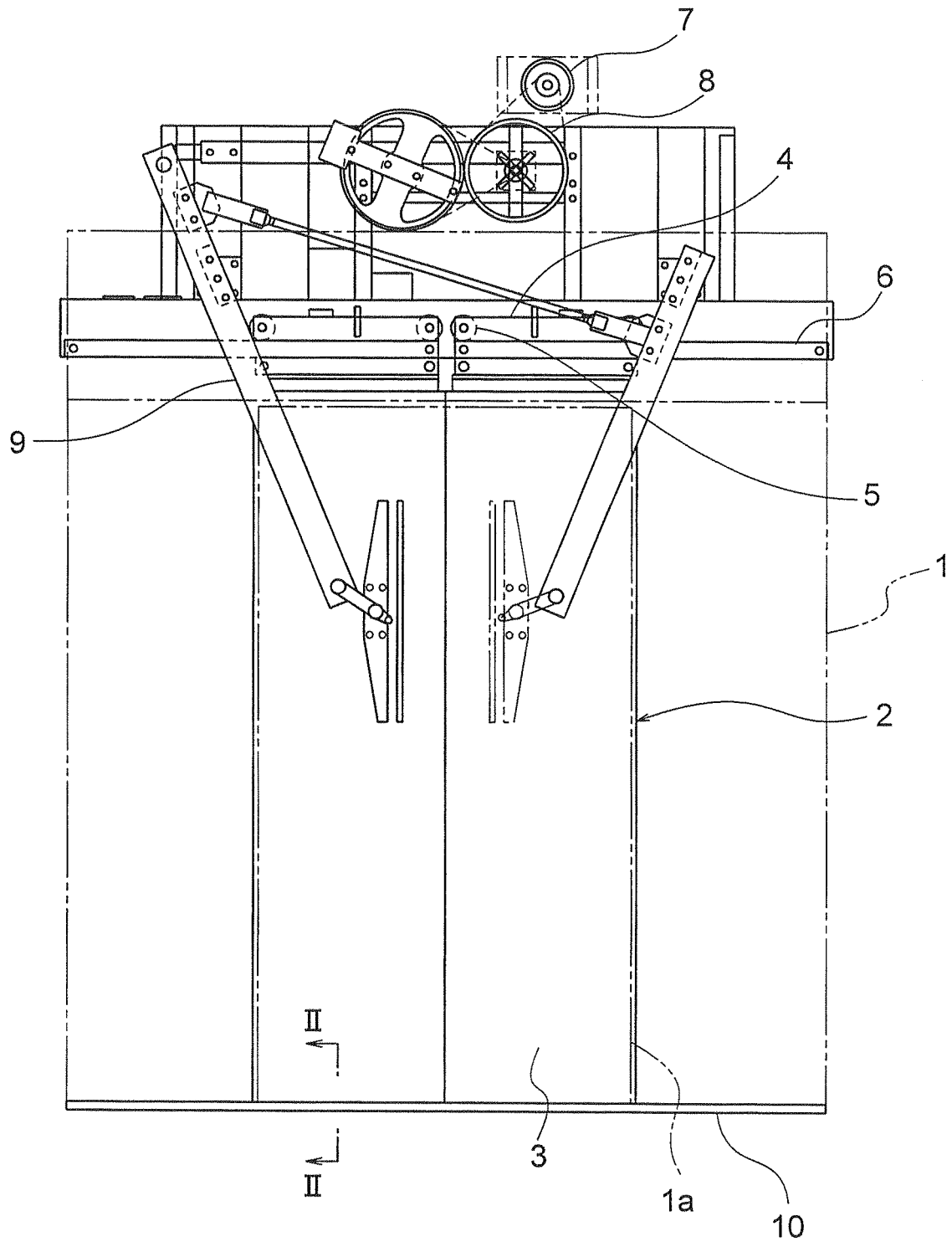
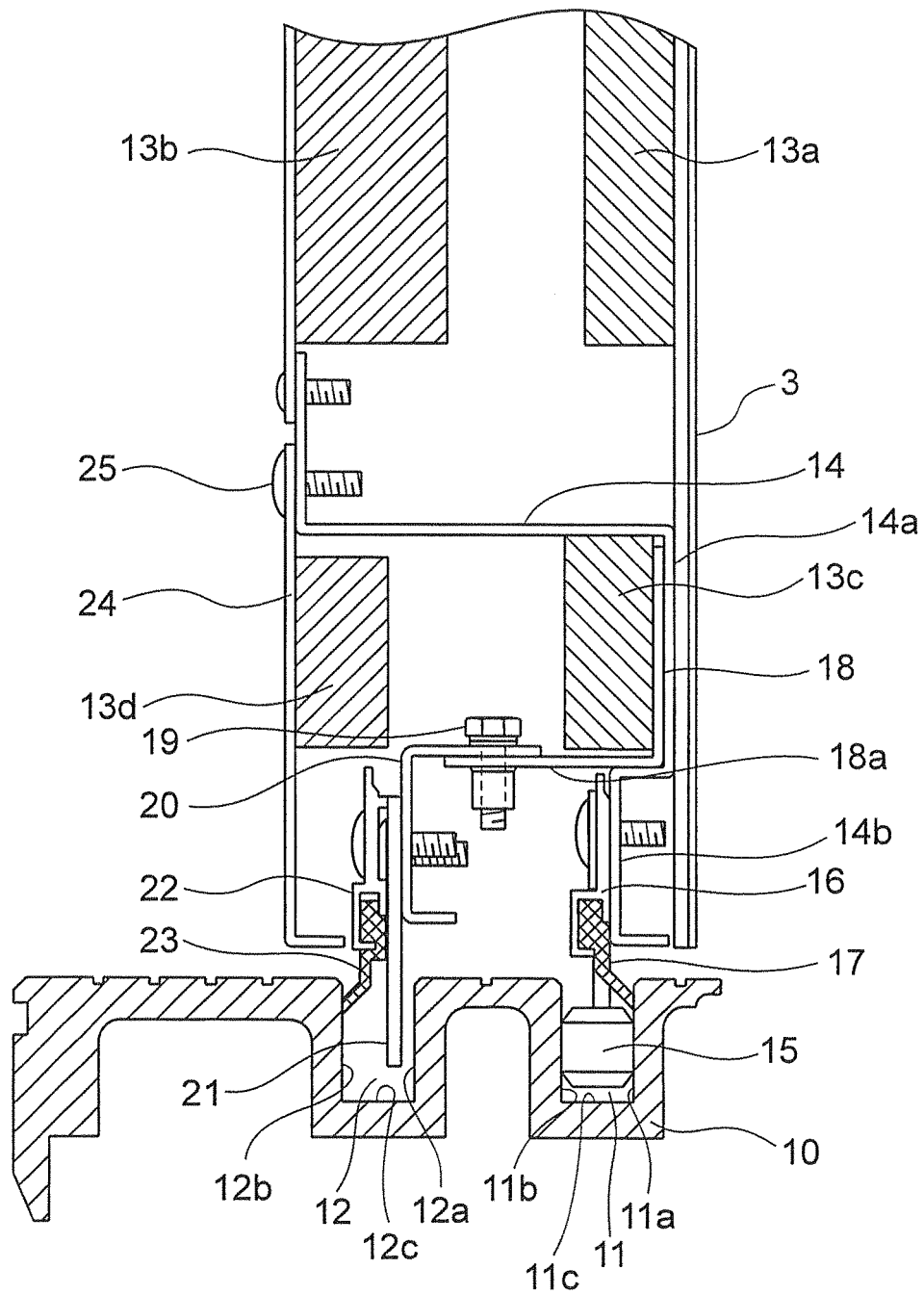


FIG. 2



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/055869

A. CLASSIFICATION OF SUBJECT MATTER

B66B13/30 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B66B13/30

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2010

Kokai Jitsuyo Shinan Koho 1971-2010 Toroku Jitsuyo Shinan Koho 1994-2010

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2862653 B2 (Inventio AG.), 11 December 1998 (11.12.1998), page 3, column 6, lines 13 to 29; fig. 6 to 7 & US 5083639 A & EP 418510 A1	1, 3-4 2
Y A	JP 10-220126 A (Sankyo Aluminium Industry Co., Ltd.), 18 August 1998 (18.08.1998), paragraphs [0004] to [0005]; fig. 1 (Family: none)	1, 3-4 2



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

14 July, 2010 (14.07.10)

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Name and mailing address of the ISA/
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/055869

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 61664/1987 (Laid-open No. 167482/1988) (Mitsubishi Electric Corp.), 01 November 1988 (01.11.1988), page 4, lines 14 to 19; fig. 1 (Family: none)	3
Y	JP 63-112389 A (Mitsubishi Electric Corp.), 17 May 1988 (17.05.1988), page 2, lower left column, lines 12 to 17; fig. 4 (Family: none)	4
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 152171/1986 (Laid-open No. 59189/1988) (Mitsubishi Electric Corp.), 20 April 1988 (20.04.1988), specification, page 6, line 19 to page 7, line 16; fig. 2 (Family: none)	4
Y	CD-ROM of the specification and drawings annexed to the request of Japanese Utility Model Application No. 138884/1985 (Laid-open No. 47588/1987) (Takenaka Corp.), 24 March 1987 (24.03.1987), fig. 1 (Family: none)	4
A	JP 4403743 B2 (Fujitec Co., Ltd.), 27 January 2010 (27.01.2010), entire text; fig. 6, 10 (Family: none)	2

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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- JP HEI10120349 B [0005]
- JP 2003306286 A [0005]